VENDOR SOFTWARE SUPPORT STRATEGIES

MAY 1986

Published by
INPUT
1943 Landings Drive
Mountain View, CA 94043
U.S.A.

Customer Service Programme - Europe (CSP-E)

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ABSTRACT

Software support is a strategic issue of fundamental importance to suppliers of service in the data processing industry.

Traditional maintenance revenues are being seriously impacted through decreased hardware costs, aggressive competition from independent maintainers, and user demand for improved levels of service at lower cost. Hardware manufacturers now have to capitalize on those growth areas which will enhance profitability. One key area is software support. Hardware manufacturers have a real competitive edge over third-party maintainers and should exploit their capability to offer a 'total service package'.

This report examines and analyses current and projected future vendor software support policies from 1986-1990 in Europe. It focuses upon support organisation issues, software maintenance procedures, pricing, personnel and training issues, and the importance of future technological and market trends in software support activities. The impacts of remote diagnostics, expert systems, and the trend towards centralisation of post-sales support activities within service supplier organisations are also analysed in detail.

The report contains 81 pages, including 24 exhibits.

VENDOR SOFTWARE SUPPORT STRATEGIES

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EXHIBITS

I INTRODUCTION

A. SCOPE

- In the current environment of pressure on customer service revenues, it is important for service vendors to distance themselves from a "hardware maintenance only" position and offer their customers a total service package.

- One important element in this total package is software support for both systems and applications. Software support is particularly important as it is often seen to be an area where hardware manufacturers have a real competitive edge over independent maintainers.

- This report, part of the INPUT 1986 Customer Service - Europe Program, looks at a number of key issues in software support:

  - Software maintenance organisational issues.

  - Aspects of the software maintenance process.

  - User views about the importance of software support and current vendor service quality.

  - Revenue and billing methods.

- Field service personnel selection and training.

- Future developments and vendor software support strategies.

B. METHODOLOGY

- This report is based on a series of face-to-face and telephone interviews conducted during the month of March 1986 with a number of principal customer service executives in leading service vendor companies, notably Prime; Perkin-Elmer; NCR; Sperry; Honeywell; ICL; Amdahl; Compagnie Generale l'Informatique; Bull; Burroughs Europe, Africa, and U.K. subsidiaries; Data General; Digital Equipment Corporation; and Hewlett Packard.

- INPUT is indebted to these companies for their kind participation in our research program. Of the fourteen interviews conducted, eight were conducted on-site and lasted up to three hours. The remainder were telephone interviews.

- A copy of the questionnaire used for the purpose of this report is provided in the Appendix.

II EXECUTIVE SUMMARY

- This Executive Summary is designed in a presentation format in order to:
  - Help the busy reader quickly review key research findings.
  - Provide a ready-to-go executive presentation, complete with a script, to facilitate group communication.
- The key points of the entire report are summarised in Exhibits II-1 through II-8. On the left-hand page facing each exhibit is a script explaining its contents.

A. IMPORTANCE OF SOFTWARE MAINTENANCE

- Software maintenance is a strategic issue of fundamental importance to suppliers of service in the data processing industry.

  - Traditional hardware maintenance revenues are stabilising. As a result, vendors need to investigate other areas of pre- and post-sales support to generate revenues and profit, particularly software support, education, and consulting.

- Products are increasingly becoming 'commodity products'. As hardware performance and reliability improves, software services will become more visible. Future sales will be characterized by software, not hardware, elements. Consequently, vendors will have to provide a differentiated range of service offerings to distinguish themselves from competitors.

- Competition in traditional maintenance activities is increasing, particularly from independent maintainers. Software support is important because it is often regarded as an area where hardware manufacturers have a real competitive edge over third-party maintainers.

- Users are more numerous, more sophisticated, and more aware of alternative sources of service. They perceive software support as the fifth most important aspect of customer service, marginally more important than price. Vendors should exploit this opportunity and move towards the provision of 'total service solutions' to maintain client fidelity and lock out competition. They should actively engage in marketing service as a product.

- Cost pressures in this highly labour-intensive business means that those companies which remain profitable are those which apply techniques to improve the quality of service whilst containing costs.

EXHIBIT II-1

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IMPORTANCE OF SOFTWARE MAINTENANCE

- Traditional Service Revenues Stabilising
- Increased Competition, Particularly from Independent Maintainers
- Users Demanding Improved Levels of Service
- New Service Offerings to Improve Profitability

B. CHANGING PERCEPTION OF SERVICE CONCEPT

- Traditionally, service has been regarded by both the vendor and user community in a negative light, perceived as a necessary evil. As margins on products decrease, more emphasis should be placed on specific growth areas. The offering of a 'total service solution' will result in pull-through sales of products, especially as the use of third-party distribution channels increases.

- Vendors should exploit customer sensitivity to quality and willingness to pay premiums for extended services.

- Service managers should engage in a proactive and aggressive approach to the sale of the service product which will halt poor revenue growth.

- A more positive approach to the marketing of service will have benefits for both user and vendors, such as:

  - Successful marketing of quality service, resulting in a competitive edge over other vendor offerings.

  - New growth opportunities.

  - Improved revenue growth through the adoption of a conscious profit-oriented approach to service selling.

  - Improved user satisfaction.

EXHIBIT II-2

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CHANGING PERCEPTION OF SERVICE CONCEPT

- From Follower to Leader
- Proactive and Aggressive Marketing of Service Products
- Catalyst for Pull-Through Sales of Products
- Generator of Revenue
- Improved User Satisfaction

C. GROWTH IN SOFTWARE MAINTENANCE ACTIVITIES, REVENUES, AND PERSONNEL

- All vendors indicated substantial growth in software maintenance activities, revenue growth, and personnel. Growth in the software products market, particularly applications products, has been fuelled by the proliferation of personal computers and will increase demand for support. Seventy-nine percent of respondent companies support custom-specific and third-party developed software packages.

- Vendors should capitalize on support opportunities generated by this growth and incorporate this support into their suite of service offerings.

- All vendors expected substantial growth of software support revenues in the next five years. Overall maintenance revenues are anticipated to grow at an annual average of 18% through 1990, and 57% of respondents expect software maintenance revenues to grow faster than hardware maintenance. Projected software maintenance revenue growth ranged from 15%-45% with an annual average of 31%. Factors contributing to this growth include growth in installed base, extension of unbundled service offerings, strong growth in applications packages, and more software support per customer.

- Two thirds of respondent companies reported growth in their software personnel in response to increased demand. In the last year, average growth was reported as 15%.

- One important goal, improved profitability and cost containment, especially in personnel, is currently being addressed by a number of respondents who are evaluating the centralisation of post-sales maintenance activities.

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GROWTH IN SOFTWARE MAINTENANCE ACTIVITIES, REVENUE, AND PERSONNEL

- High Growth in Software Products, Particularly Applications Products
- Software Maintenance Revenue Growth - 31% AAGR to 1990
- Personnel Growth - AGR 15%
- Improved Profitability via Centralisation of Support Activities

D. TREND TOWARDS CENTRALISATION OF SOFTWARE SUPPORT FUNCTIONS

- Software support is still a major cost pressure on corporate profitability. As users demand improved quality of service, vendors have to devise strategies to maintain high levels of service whilst containing costs associated with this function.

- Whereas the current dominant organisational structure is geographic coverage, vendors are moving towards a centralized product-oriented approach which provides specific advantages, such as:

  - Avoiding duplication of effort in different geographic areas to fix problems which have been resolved elsewhere.

  - Allowing for the optimal utilisation of scarce specialist software resources.

  - Responding immediately to users' problems.

  - Using corporate databases of software faults and fixes to enhance the capability to fix faults remotely and eliminate abortive on-site calls, thus containing costs.

- Implementation of centralised and phone-in centres has already proved to be effective, as respondents stated that on average 85% of software faults are being resolved without recourse to on-site visits.

- Centralisation has a number of significant impacts on the handling of software maintenance, user involvement, organisational structures, and personnel requirements and qualifications.

EXHIBIT II-4

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BENEFITS OF CENTRALISED PRODUCT-ORIENTED SOFTWARE SUPPORT ACTIVITIES

- Improved Response
- Improved Utilization of Scarce Software Resources
- Avoidance of Duplication of Effort in Problem Solving
- Improved Cost Effectiveness
- Economies of Manpower

E. SOFTWARE MAINTENANCE PERSONNEL SELECTION AND TRAINING

- Most vendors anticipated growth in the size of their software maintenance personnel force. The current most favoured sources of recruitment are graduate entry and hire and train.

- Vendors do expect the increased use of remote diagnostics and centralisation to impact organisational structures, recruitment and training policies, and the profile of the field engineer. There will be a gradual evolution towards a 'two tier' structure of engineers in the future with field engineers assuming a purely logistics role at user sites and with specialists located at remote centres.

- Some vendors are already providing additional training programs in 'people management' skills to field engineers so that they will be able to provide:

  - An enhanced company image and visibility.

  - Pre- and post-sales consulting, customer education, training, and consulting.

  - Involvement in planning cycles for systems procurement at user locations.

- Vendors will need to invest in training programs to adapt personnel to new working environments. They also need to concentrate efforts in this area as few were able to comment on training costs and strategies for the future.

- In view of the increasing concentration on vertical markets, vendors may consider recruitment from specific industry sectors, although few vendors anticipate shortages of personnel through 1990.

EXHIBIT II-5

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SOFTWARE MAINTENANCE PERSONNEL SELECTION AND TRAINING

- Growth in Personnel
- Impact of Remote Diagnostics and Centralisation of Support
- Polarization towards 'Two Tier' Structure
- Increased Emphasis on People Management Skills

F. TRENDS IN SOFTWARE PRICING

- The goal of service suppliers is to establish software support as a separate profit centre. Since vendor reputation is a key factor, pricing policies should support, not diminish, this aspect.

- Vendors should emphasize quality of support whilst pricing aggressively.

- Key trends contributing to the attainment of these goals are the unbundling of service elements, the introduction of a wider spectrum of value-added service contracts, strategies enabling vendors to eliminate 'give away' elements in service, improvement in cost management, and allowing users to purchase required service support elements, thus increasing user satisfaction.

- Vendors are trying to tie users into contractual agreements to lock out competition and improve cash flow. Hence, vendors are reluctant to provide service on a time and materials basis.

- One significant fact revealed in the survey is that vendors do not adequately capture and monitor cost data relating to software maintenance activities. This should be undertaken promptly as it directly translates into cost effectiveness and enhanced profitability.

- Vendors should also exploit users' willingness to pay premiums for extended services.

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TRENDS IN SOFTWARE PRICING

- Goal to Establish Software Support as Profit Centre
- Increased Unbundling of Service Elements
- Wider Spectrum of Value-Added Services
- Automation of Billing Methods to Improve Cash Flow
- High Need to Improve Monitoring and Allocation of Costs

G. FUTURE TRENDS IN SOFTWARE MAINTENANCE

- Remote diagnostics appears to be the central issue of most concern to vendors in shaping future software maintenance activities, with implications for organisational structure, personnel, user involvement, and support procedures.

  - Using remote diagnostics for a significant part of the diagnostic process will enable vendors to support users directly from a central location and use less qualified staff at field sites.

  - As a result, user involvement will become increasingly important as long as strategies are employed to maintain revenue levels.

  - The establishment of a communications network to support the remote diagnostic centre also provides the capability to transmit directly software corrections and updates over the network. These reductions in cost, however, must be traded off against the required costs for the development and operation of these capabilities.

- As remote diagnostics will enable companies to operate from a central core of specialists with less qualified staff in the field, additional costs will be incurred to develop different training programs for staff to deal with a different working environment.

- Another significant development will be the introduction and use of artificial intelligence techniques to predict software faults. This will be an important facility to maximize user satisfaction in the future.

EXHIBIT II-7

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FUTURE TRENDS IN SOFTWARE MAINTENANCE

- Remote Diagnostics
- Increased User Involvement
- Distributed Data Processing
- Impact on Training, Personnel, and Organisational Structures
- Use of 'Expert System' Techniques

H. RECOMMENDATIONS

- To remain competitive and profitable, vendors should emphasize non-hardware-related service to improve user satisfaction. They must undertake promotional and marketing campaigns to improve company visibility and image whilst emphasizing the importance of post-sales support, particularly software support, consulting, and education.

- Similarly, vendors should tie users into contractual agreements at an early stage in the sales cycle and become involved in client planning activities.

- With respect to software maintenance, vendors should unbundle software services to generate profitability, offer a wider range of services, increase the use of remote diagnostics, and increase user involvement in maintenance.

- The use of distributed data processing will increase the number of user locations and place higher demands on service support. Vendors should make efforts to improve logistics operations and use field personnel to provide consulting activities and retain face-to-face contact with users.

- A main goal is to improve cost effectiveness. One key element will be the development of software databases to enable vendors to fix more faults remotely. A further key is the integration and centralisation of all post-sales support functions. Finally, software maintenance costs must be adequately monitored and tracked.

- Software maintenance organisations should be more actively involved in product development to ensure reliability is evaluated.

- Attention must be paid to training and personnel development.

- Vendors should become 'single-source maintenance and service' providers.

EXHIBIT II-8

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RECOMMENDATIONS

- Define Strategy
- Improve Visibility and Image as Single-Source Solution Providers
- Increase the Use of Remote Diagnostics
- Improve Logistics Operations
- Integrate All Post-Sales Support Functions
- Monitor Costs

III SOFTWARE MAINTENANCE ORGANISATIONS

A. DEFINITION OF SOFTWARE MAINTENANCE

- For the purposes of this study, software maintenance comprises a number of key functions: They are:

  - Diagnosis - Fault detection and debugging.

  - Correction - Installation of a software fix or provision of an alternative or workaround solution.

  - Control - Configuration management of the software products to ensure that those being used reflect the most current available software.

  - Distribution - The transfer of information from the headquarters organisation including inter alia, specifications, manuals, listings, software status reports, and program specifications.

  - Educational Support - Technical assistance to users in the use of software products supplied with the system either on-site or by telephone.

B. ORGANISATION OF THE SOFTWARE MAINTENANCE FORCE

- Provision of software support can be organised in a number of different ways, and consequently the relationship with the mainstream customer service activities will change.

- The basic types of organisations that are currently used by companies interviewed are:

  - Geographic - This organisation has the software maintenance force responsible for all activities within a geographic area and looks like a typical field service branch-type structure.

  - Functional - This organisation has the software maintenance force divided by functional discipline; e.g., systems programmers, communications specialists, and application industry specialists. This type of organisation is typically located centrally either at headquarters or at the regional level.

  - Product - This organisation has the software force divided by specific product; e.g., operating systems. This type of organisation can be either centrally located or distributed among branch locations.

- Exhibit III-1 shows the preference among the companies interviewed. As can be seen, companies frequently adopted a mixture of all organisational levels simultaneously in an effort to maximize the availability of scarce software resources.

- Although respondents stated that geographic structure best described their current software maintenance organisation, it should be recognised that these are not self-contained units but rely on additional support from product and functional specialists who may not be located in their geographic area of responsibility.

EXHIBIT III-1

TYPES OF SOFTWARE MAINTENANCE ORGANISATIONS
BY COMPANIES INTERVIEWED

TYPE OF ORGANISATIONAL STRUCTURE	NUMBER OF COMPANY RESPONSES
Geographic	10
Functional	4
Product	8
Total	22

Number of companies interviewed: 14

- Vendors are increasingly aware of the key disadvantages of a geographic structure.

  - It is difficult at local levels to have staff with relevant experience to handle software functional areas.

  - Other parts of the industry are organising on vertical market areas and building up specialties. This is difficult to support on a purely geographic basis.

C. RELATIONSHIP BETWEEN HARDWARE AND SOFTWARE MAINTENANCE

- In trying to provide total customer support, it is important that the relationship between software maintenance and hardware maintenance activity is clear cut and simple.

- In most cases, the field service engineer is responsible for some first-line system software support, and where geographic structure is operating, software support specialists will report to the same local manager as the hardware support team.

- Increasingly, software support is being treated as an autonomous activity, albeit having a close working relationship with the mainstream customer service activity.

D. INVOLVEMENT OF ORGANISATIONAL ELEMENTS IN SOFTWARE MAINTENANCE

- In order to determine the organisational relationship between various support levels in software maintenance, companies were asked to comment upon the interaction between different support elements. The three organisational elements examined were:

  - Field service organisation - personnel located in branch/district offices in the field.

  - Separate support organisation - personnel located in central locations whose responsibilities include the provision of staff level support to field organisations. A non-dedicated group, their other software responsibilities include software documentation, central software libraries, configuration management, etc.

  - Remote support group - a dedicated organisation of highly specialised personnel. Their sole function is the provision of software maintenance support directly to the field organisation or end user.

- Exhibit III-2 shows how the respondents involve various organisational elements in software maintenance activity. All companies used a combination of two or more of these elements in performing software maintenance functions.

- The majority of vendors are moving towards a more centralised, product-oriented software support organisation. There are a number of factors contributing to this development.

  - Where resources are scarce, this approach makes the best sense as it avoids:

EXHIBIT III-2

ORGANISATIONAL ELEMENTS INVOLVED IN SOFTWARE MAINTENANCE ACTIVITIES

ORGANISATIONAL ELEMENT	NUMBER OF COMPANY RESPONSES
Field Service Organisation	14
Separate Support Organisation	10
Remote Support Centres	12
Other	6
Total	42

Total number of companies interviewed: 14

- 'Reinventing the wheel' in different geographic areas as problems which have been solved elsewhere appear in another locality. It is important to build up expertise in problem solving as problems occur on a product rather than purely geographic basis.

- Conflict of interest on those occasions where recognized software experts have to be detached from their normal duties to field service problems.

- Vendors are increasingly obliged to devise techniques to reduce cost pressures in a highly labour-intensive business.

- Users are demanding improved software maintenance performance and a faster resolution of problems.

- Reasons provided by respondents for increasing centralisation and integration of support functions are summarised in Exhibit III-3.

- The long-term goal of vendors is to centralise all post-sales activities into a single 'solution centre' where appropriate pools of expertise are readily accessible to both field staff and users.

- One aspect of this policy has been the introduction of phone-in centres as the first level of support for software problems and queries. These centres are variously known as:

  - Centralized software centre.

  - Central response centre.

  - Customer assist facility.

EXHIBIT III-3

REASONS FOR INCREASING CENTRALISATION AND INTEGRATION OF SUPPORT FUNCTIONS

- 'Avoids duplication of effort'.
- 'Centralisation (via a national telephone support centre) provides for economy of manpower, increased productivity, improved resource utilization, and greater cost effectiveness'.
- 'Site engineers have access to support specialists and databases located centrally. This means that the majority of problems can now be resolved remotely'.
- 'We are moving towards centralisation of support with product responsibility'.
- 'We are moving towards an increased convergence of support activities (both hardware and software). It makes more sense to have centralised support with product specialists as products often encompass more than one vertical market'.
- 'The fundametally geographic organisation is backed up by product-oriented specialists via telephone support'.
- 'The use of tactical response centres ensures immediate response to field service queries'.

- Technical assistance centre.

- Software support centre.

- Central hotline service.

- As a general rule, problems are filtered via the service desk through to the appropriate source of expertise whether it is hardware or software. Applications software problems are usually channelled through to systems services divisions.

- In addition to product specialists, engineers also have access to:

  - Corporate databases of software faults and fixes.

  - Databases of user information; e.g., configurations.

  - European support centres.

  - European- and U.S.-based development and design teams.

- Escalation procedures implemented are dependent upon the complexity and criticality of the problem.

- As a result of these developments, vendors now report that in excess of 85% of problems are resolved without recourse to on-site visits.

- Exhibits III-4 and III-5 show how individual vendors bring together the various organisational elements to solve user problems.

EXHIBIT III-4

SCHEMATIC SOFTWARE SUPPORT ORGANISATIONAL STRUCTURE
COMPANY "A"

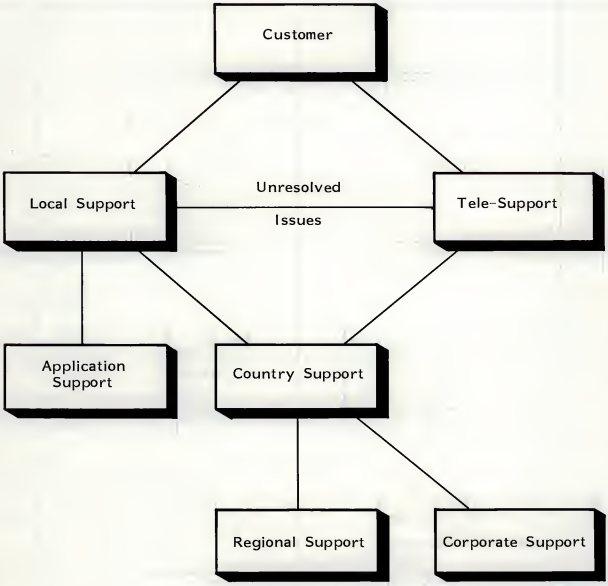
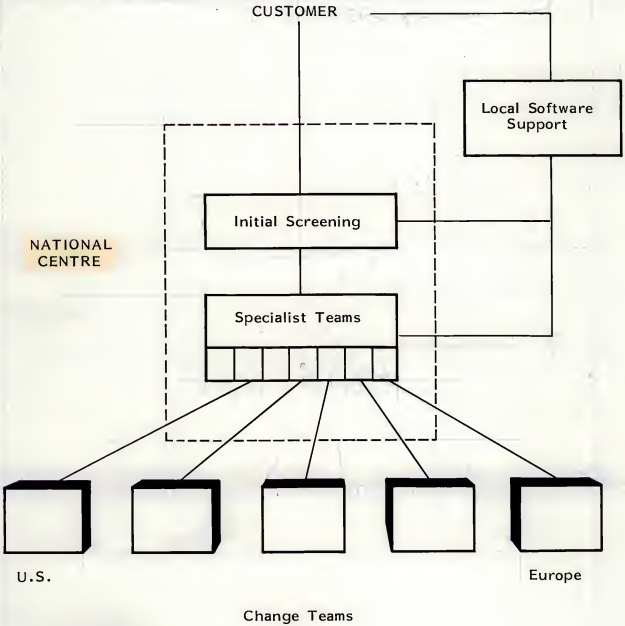


EXHIBIT III-5

SCHEMATIC SOFTWARE SUPPORT ORGANISATIONAL STRUCTURE
COMPANY "B"



- Centralisation has advantages for both vendors and users, as follows:

  - The user has the benefit of easier access to appropriate sources of expertise via a central response centre. As a consequence, there is a reduction in system downtime.

  - For the vendor, the allocation of specialists in centralised resource centres means improved resource utilisation. The use of corporate databases of faults and fixes enhances the capability to fix faults remotely and eliminate abortive on-site calls, leading to improved cost effectiveness.

E. SIZE AND GROWTH OF SOFTWARE MAINTENANCE ORGANISATIONS

- Of the companies interviewed, their total software maintenance forces ranged in size from 20 to 450 or, in terms of a percentage of the total customer service organisation, from 5%-38%.

- On average, software maintenance organisations accounted for 13% of total customer service personnel.

- The figures are a little misleading in that they only include dedicated software support personnel, whereas in most cases hardware maintenance engineers may also undertake system software maintenance. Similarly, in most instances applications software support personnel do not report into customer service but to systems divisions directly responsible to marketing and sales divisions. Thus, the importance of software maintenance is greater than the 13% shown.

- All respondents stated that they believed software maintenance to be a significant function within customer service and expected its importance to increase substantially in the next five years.

- A reflection of this may be seen in respondents' opinions regarding the growth in the size/structure of software support organisations within the last 12 months.

- Of the 14 companies interviewed, two-thirds had experienced growth rates in personnel size from 10%-50%.

- Only five companies stated that the size of the software maintenance force had remained stable or experienced minimal growth. This does not mean that companies had not experienced significant volume growth in business, but simply that this growth had been handled not by employing more staff but by introducing automated support functions where appropriate, resulting in measurable productivity gains.

- Factors regarded by vendors as attributable to growth in the size of software maintenance personnel force include:

  - Response to volume business growth.

  - More software per box per customer site.

  - Growth in extended services, particularly in pre-sales consulting.

F. IMPORTANCE OF SOFTWARE SUPPORT

- INPUT's user research continues to emphasize that the most important aspects of customer service for users are the 'big four', which are:

  - Product reliability.

  - System availability.

- Response time.

- Repair time.

- Software maintenance is the fifth most important aspect, being marginally more important than price.

IV SOFTWARE MAINTENANCE PROCESS

A. TYPES OF SOFTWARE PRODUCTS SUPPORTED

- There are two general classes of software supported by the software maintenance organisations:

  - Systems products - this category of products includes operating systems, compilers, and other systems utilities.

  - Applications products.

- Exhibit IV-1 shows the type of software products supported by the companies interviewed.

  - All vendors supply some level of support on the range of products they market dependent upon the product type and contractual agreements with users.

  - Universal support is provided on vendors' own systems software. Four companies also provided limited support on other vendor system software—notably IBM.

  - Nearly all respondents provided support on custom-developed software. In a number of cases, this would be provided by the systems division responsible for the writing of the software.

EXHIBIT IV-1

TYPES OF SOFTWARE PRODUCTS
SUPPORTED BY COMPANIES INTERVIEWED

TYPE OF SOFTWARE PRODUCT	NUMBER OF COMPANIES*
Own Systems Software	14
Other Vendor Software	4
Custom Applications	13
Third-Party Applications	10

*Total number of respondent companies = 14.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- Although software maintenance personnel would provide some consulting support for user-developed software, they did not assume maintenance responsibility.

- With the proliferation of small business and corporate personal computers, there has been a rapid growth in the area of third-party applications packages. Vendors are increasingly obliged to provide some level of support on these products. This is reflected by the fact that many of the companies interviewed stated that some level of support was provided. General policy was that if the application package were part of the company product offering, then it would be supported. This support is handled in a number of different ways:

  - One company referred the customer to the author of the software for maintenance.

  - Another company, although itself assuming responsibility for third-party software, subcontracted out the maintenance function.

  - A third company supplying turnkey CAD/CAM systems in conjunction with a software house divided responsibility for maintenance.

B. NUMBER OF SOFTWARE MAINTENANCE CALLS AND METHODS OF HANDLING

- In order to determine the burden of software maintenance on companies, respondents were questioned as to the total number of software maintenance calls handled in the last 12 months. Only eight companies were able to provide statistics on this and these showed a wide variation in frequency.

- It is interesting to note that the nature of calls is changing as the profile of the market develops. More and more queries handled at central response centres related to educational assistance on low-end products; e.g., clarification of documentation and requests for information rather than the reporting of faults.

  - One company which reported handling 300 micro-related calls per month in 1985 now reports an increase to 460 calls per month in 1986.

- Because of the flexibility of contracts, vendors believe that users now feel more confident using support services available to them, especially for low-end products.

- Because of the centralisation of support activities with improved productivity techniques, vendors express few fears about their capability to handle an increased volume of calls. The success of these operations is reflected in the limited number of calls resulting in on-site visits. On average, 85% of calls are fixed over the telephone.

C. COST OF A SOFTWARE MAINTENANCE CALL

- Respondents were asked about the cost of a software call to the organisation. Only four companies had this information, and two of these were not prepared to divulge the data. One company was able to report that the cost of a software problem handled by phone was in the range of 70-100 dollars.

- When queried as to whether the diagnosis and repair of a software fault at a user location was different from a hardware fault in terms of cost, it is interesting to note a divergence of opinion among respondents.

- Although it was not possible to obtain quantitative data, companies did provide comparative estimates on software versus hardware calls. The results are presented in Exhibit IV-2.

- Respondents who believed software maintenance calls to be cheaper than hardware calls handled the majority of their software calls remotely.

- One company stated that 85% of software calls could be resolved remotely in an average time of 0.5 hours, whereas the average hardware fix time was 2-3 hours.

D. CURRENT TYPES OF SOFTWARE DIAGNOSTICS

- Exhibit IV-3 provides a comparison of the various types of software diagnostics employed by the companies interviewed.

  - As can be seen, almost all provide some form of assistance. Only 27% (3 out of 11) provided no software diagnostic tools. Three also relied on in-built program self-diagnosis.

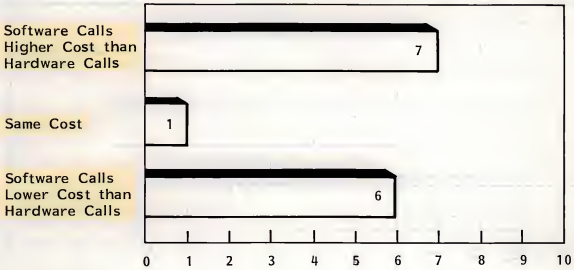
  - The most common approach is to provide a dump analyzer (54% of respondents). This approach does demand a degree of detailed program familiarity and will place demands on engineer training.

  - Looking more the future, one company was using, albeit in a limited way, artificial intelligence techniques and fault user databases to predict software faults. As hardware reliability increases and software faults become more exposed, this will be a very important facility in maximizing user satisfaction.

EXHIBIT IV-2

COMPARISON OF COST BETWEEN HARDWARE
AND SOFTWARE MAINTENANCE CALLS BY COMPANIES INTERVIEWED

SAMPLE PROFILE



Number of Respondents: 14

Higher Cost

'Labour resource costs for software maintenance are more expensive'.

'It is less expensive to the user but more expensive to us'.

'Software is more complex and therefore more expensive'.

Lower Cost

Software maintenance costs are cheaper than hardware calls since the majority of calls are handled remotely.

Average fix time for a software facility is 0.5 hours, whereas an average hardware fix is 2-3 hours.

EXHIBIT IV-3

TYPES OF SOFTWARE DIAGNOSTICS PROVIDED

TYPE OF DIAGNOSTIC	NUMBER OF COMPANIES USING*
Dump Analyser	6
Database of Known Problems	5
Self-Diagnosing Software	3
Remote Diagnostics	2
Development Tools	1
Performance Monitor	1
Special Edit Debug	1
Software Simulator	1
Artificial Intelligence	1
None	3

* Multiple types allowed.

Number of Respondents: 11

E. CURRENT TYPES OF SOFTWARE DOCUMENTATION

- For the purposes of this report, software documentation provided to both field and user personnel consisted of three types:

  - Technical Documentation - This category of information consists of product technical descriptions, technical and systems specifications, software program specifications, etc. These documents are created during or immediately after the product development stage and are generally used by field service personnel and end users for reference purposes.

  - User Documentation - This category of documentation consists of operator manuals, system procedure documents, user guides, etc.

  - Source Listings - This category of documentation is the instruction listing of the program and is essential for making software program changes.

- Exhibit IV-4 shows the range of documentation provided to software support personnel whilst Exhibit IV-5 shows that users are limited mainly to receiving operation and training manuals rather than helping to fix and patch faults.

- The release of source listings is particularly restricted among users because companies did not want unofficial patches being made to software programs which as a result would create difficult maintenance problems. Companies that did release source listings limited the release to large EDP users.

EXHIBIT IV-4

TYPES OF SOFTWARE DOCUMENTATION PROVIDED TO FIELD SERVICE PERSONNEL

TYPE OF DOCUMENTATION	NUMBER OF MENTIONS*
Program Listings	4
Database of Fixes	4
User Manuals	4
Patch Information	4
Logic Manuals	3
Source Code	3
Support Release Documentation	3
Release Notices	3
Videos	1

* Multiple choice allowed.

Number of Respondents: 11

EXHIBIT IV-5

TYPES OF SOFTWARE
DOCUMENTATION PROVIDED TO USERS

TYPE OF DOCUMENTATION	NUMBER OF MENTIONS*
Operating Manuals	10
Training Manuals	9
Newsletters	5
Patch and Documentation	4
Releases	3
Source Code	2

* Multiple choices allowed
Number of Respondents: 11

F. DISSEMINATION OF SOFTWARE CORRECTIONS AND UPDATES

- Once a software fault has been detected and corrected at a user's site, the information must be disseminated to all other user sites with a similar installation. The reporting of the software fault to the field organisation is as important as correcting the immediate problem at a single user site.

- The methods of disseminating information are shown in Exhibit IV-6. The main approach is to build up a database of faults and fixes readily available to field engineering staff. Users are not automatically contacted as soon as a fault is discovered.

- The dissemination of the correction is dependent upon the criticality of the fault. As a result, different delivery mechanisms are available:

  - Critical information may be sent by special mailings, telephone, telex, or via data communications.

  - Two companies had implemented customer on-line database services for large systems and expressed the intention of extending this service to include medium and small systems. This is a chargeable service.

  - Less critical information is incorporated into either monthly or quarterly newsletters, bulletins, or publications.

- Other methods include incorporating the software fix information into new product releases on an annual basis.

- New product release information and updates are disseminated to users via educational or distribution centres within country markets. Central distribution of this information directly to user sites offers certain efficiencies since it relieves the field organisation of this responsibility.

EXHIBIT IV-6

METHODS OF DISSEMINATING SOFTWARE CORRECTIONS AND UPDATES

DISSEMINATION METHOD	NUMBER OF MENTIONS*
Database of Fixes	10
User Newsletter	5
Software Revision	3
Special Mailings	1
Direct Emergency Contact	1
Tape Release	1

* Multiple choices allowed.

Number of Respondents: 11

- Most software updates are user-installable, but the field service organisation may be called in to install the product in instances where:

  - The user is unsophisticated.

  - The user has taken a contract to include installation.

  - The product is complex.

- Eighty-six percent of vendors said that users usually install software releases themselves, but they would install if necessary.

- Field service organisations are not generally involved in the testing and evaluation of new products and updates.

  - This function is undertaken by autonomous quality control, evaluation, or development teams.

V SOFTWARE MAINTENANCE PRICING

- Companies are investigating and adopting a more disciplined and market-oriented approach to software pricing.

- The objectives of current pricing methods are:

  - To establish software maintenance activities as a separate profit centre.

  - To be competitively priced.

  - To provide more flexible contracts to users by offering differentiated support contracts and, hence, generate cash flow and profit.

- Vendor reputation is often the key factor, and pricing policy should support and not diminish this aspect. Vendors should emphasize quality whilst pricing aggressively. They should consider procedures for pricing reviews and ensure that these take place at regular intervals.

A. TYPES OF SOFTWARE MAINTENANCE PRICING

- There are three basic ways companies bill for software maintenance:

- Total Service Charge - This is a combined charge at a fixed rate for both software and hardware maintenance (annual, monthly, or quarterly).

- Separate Software Service Charge - This is a fixed rate service charge for software maintenance only.

- Time and Materials - This is a variable charge based on actual time spent in software maintenance and is usually an add-on to one of the above charges.

- Most companies have a combination of these charges to reflect varying product types and user requirements. Half of the respondents interviewed provide software service as a separate chargeable item, but all will provide pricing contracts required by users, thus showing a trend towards increased flexibility.

- It is evident that even though the general trend is towards unbundling of software maintenance, it is often chargeable as a separate annual or monthly payment.

  - One company reported having recently unbundled software maintenance as a separate annual charge payable in advance, whereas previously it had been bundled into the monthly license fee.

- To maintain revenues, vendors are increasingly trying to tie users into contractual agreements and, as a result, time and materials charges where applicable are becoming prohibitively expensive.

- Very little information was provided regarding average monthly charges for software maintenance due to the wide range of products supported and contract types. The following data, however, was provided for monthly average charges:

- Example 1: 3,000-4,000 dollars - large system configuration.

- Example 2: 1,500-2,000 dollars - large system configuration.

- Example 3: 1,000-1,100 dollars - medium system configuration.

- Example 4: 1,000 dollars - medium system configuration.

- Example 5: 200 dollars - microcomputer.

- None of the vendors reported significant changes to their pricing methods in the last 18 months, but were introducing automated billing methods to improve cash flow.

- The aim of all vendors is to establish software maintenance as a separate profit centre.

B. USE OF SOFTWARE WARRANTY

- The warranty issue is still wide open in the marketplace. Over half of the vendors do provide a warranty for both systems and applications software--57% on systems software and 55% on applications software. The duration of the warranty ranged from 60-90 days.

C. SOFTWARE MAINTENANCE AS A PROFIT VERSUS COST CENTRE

- Nine of the vendors interviewed reported that their software maintenance activities were profit centres. Four companies indicated that it was a

contributor to overall corporate profitability. Only one respondent regarded software support as a cost centre.

- As software support becomes burdensome in terms of resources used and valuable in terms of revenue generated, vendors will have to monitor software service revenues and costs more closely.

- It will also be important to monitor the time spent by hardware engineers fixing or investigating software faults.

- Vendors reported that for their overall maintenance revenues for 1985, software represented between 3% and 25% of total maintenance revenues.

- Most respondents expect overall maintenance revenues to increase over the next five years at an average of 18%. Reasons given for the increase are listed in Exhibit V-1.

- Software revenue is expected to grow at a faster rate than hardware revenue. The price of hardware service contracts will fall, reflecting the decrease in hardware product end prices. One company anticipated the decrease in hardware contract prices to fall from 12% to 2% of user price within the next five years.

- Software maintenance revenue will become increasingly important as a generator of company profits. Projected growth rates range from 15%-45% with an average of 31%.

- This is reflected by one respondent's statement that their software maintenance revenue in 1985 of 1.5 million pounds was projected to increase to 12 million pounds if present trends continue. The company had already witnessed a 50% increase in contracts in the last fiscal year, representing a 100% growth in value.

EXHIBIT V-1

FACTORS CONTRIBUTING TO SERVICE REVENUE GROWTH

- Continued Growth in Installed Base
- Extension of Service Offerings; e.g., Disaster Recovery
- Strong Growth in the Use of Applications Packages
- Price Increases
- Single-Source Maintenance
- Wider Suite of Contract Offerings
- Introduction of New Technology
- More Software Support per Customer per Box
- Move into Third-Party Maintenance

- The potential for profitability does exist within software maintenance organisations, although some companies have not yet refined accounting methods to assess software profitability.

VI SOFTWARE MAINTENANCE PERSONNEL SELECTION AND TRAINING

A. SOURCES OF SOFTWARE MAINTENANCE PERSONNEL

- As indicated in Chapter III, companies were expecting to increase the size of their maintenance organisations significantly in the next five years.

- Exhibit VI-1 presents the ranking of personnel sources currently employed to meet staffing needs. Respondents were asked to rank each of the possible sources on a scale of 1-5 with five being the highest.

- As can be seen from the exhibit, the two top sources for selecting personnel are:

  - Graduate entry.

  - Hire and train.

- The preferred recruitment route is via direct entry from universities, polytechnics, and engineering schools. Several vendors provided formal graduate training schemes and were aware of other companies within the industry providing apprenticeship schemes. Other companies provided sponsorship courses in collaboration with polytechnics or governmental bodies. Graduate entry software training courses could last between two months to two years.

EXHIBIT VI-1

RATING OF PERSONNEL SOURCES, 1986

	NUMBER OF RESPONSES RATED				
	Least Important				Most Important
	1	2	3	4	5
Graduate Entry	2	1	4	5	2
Hire and Train	5	0	3	4	2
Recruit from Other Functions within Company	4	3	4	2	1
Recruit from Other Industries	4	4	5	1	0
Recruit from Competition	8	1	5	0	0

- Another source is to hire and train personnel via the agency route. In this case, personnel were required to have at least two years experience in software.

  - Although some of these recruits may come from the user base, vendors stated that direct recruitment from client companies was not a favoured option due to inherent problems.

- The third most important source of personnel was to train in-house personnel from other functions, notably manufacturing and hardware engineering.

- In view of the increased consideration of vertical markets, vendors perhaps ought to consider greater recruitment from other industries in order to capitalize on specific industry knowledge.

- All companies were reluctant to recruit from the competition because of the inherent disadvantages:

  - They would be obliged to 'detrain' people in other company maintenance procedures before they could become operational.

  - They may be obliged to pay higher salaries.

- However, company respondents said that they had not experienced any major difficulties in recruiting personnel and did not anticipate demand outstripping supply.

- To understand whether there would be any significant changes in personnel sources over the next five years, managers were asked to rank the same sources as for 1986. It is apparent that companies do not see any drastic changes from the sources they are currently using.

- However, vendors did anticipate the increased usage of remote diagnostics and centralized support to impact organisational structures, recruitment and training policies, and the profile of the field engineer.

- Vendors believe there will be a polarisation towards a 'two tier' structure of engineers in the future, notably less experienced personnel assuming a purely logistics role at field level coupled with highly skilled specialists located at remote centres.

- Some vendors spoke of recruiting 'van driver'-type personnel for field service functions whilst others are beginning to train field engineers increasingly in additional 'people management' skills in order to assume a more consultative role at user sites.

B. SOFTWARE MAINTENANCE TRAINING

- Eighty-five percent of companies indicated that they had instituted formal training programs for hardware personnel in software support. Training periods ranged from five days to six weeks with the medium time spent on such courses being four weeks.

- Only two companies did not provide software training for hardware personnel.

- Where training is provided it was found that in 50% of the cases all hardware engineering personnel had attended courses. On average 87% of all engineers had been trained in software support.

- Software maintenance personnel were similarly requested to undertake formal training courses lasting up to a maximum of 80 days. One company had instituted a formal program lasting up to two years.

- The primary reason for mandatory attendance at training courses was to establish a base of understanding of the required procedures for functioning within the existing software maintenance organisation and provide detailed product technical information.

- Companies interviewed specified that there was a wide range of courses available to maintenance personnel, many of which were offered on an 'ad hoc' basis according to user and company requirements.

- As a result, much training is undertaken on an ongoing basis covering such areas as new product developments, industry markets, hardware interfacing, resource allocation, and interface management.

- The vast majority of courses are in-house. Very little use is made of external training organisations as companies prefer to develop in-house courses specifically geared to its own personnel. The one exception is in the case of 'people management' and interactive skills.

I. TYPES OF TRAINING PROGRAMS

- There are basically two types of training programs offered to software maintenance personnel:

  - Procedures and operations.

  - Technical product training.

- Procedures and operations training consists of mainly the following elements:

  - Organisation structure.

  - Reporting and forms.

- Internal company interfacing; e.g., hardware maintenance personnel, marketing and sales, and product development.

- The primary objective of these courses is to provide an orientation on internal company functions and interfaces in dealing with various software maintenance situations. The goal is to establish a common knowledge about procedural issues for accomplishing maintenance activities.

- Technical product training is designed to provide detailed technical information about the various products that are to be maintained.

2. OTHER TYPES OF TRAINING

- In addition to the above mentioned courses, companies are actively involved in promoting 'people management' skills. The purpose of this is to improve interpersonal communications skills and present the 'correct image' of the company to the end user.

- Vendors also reported a considerable amount of on-the-job training at branch levels. It is extensive because of the types of working relationships established in the field.

- Four companies also mentioned that there was a considerable amount of self-education, video usage, product refresher courses, etc.

3. EFFECTS OF FORMAL TRAINING ON COMPETITION

- Only two companies stated that field service personnel received salary increases upon completion of training courses. The range of salary increases was between 9%-15%, based on student performance.

- Generally, the policy is for salary increases to be tied to the assessment of an engineer's performance on an annual or biannual basis.

- Fifty-seven percent of respondents indicated that upon completion of training programs, personnel may move from field service to other functions, notably:

  - Software development group.
  - European support and market support groups.
  - Customer education.
  - Pre-sales consulting.
  - Sales and marketing.
  - Systems engineering.

4. CURRENT AND PLANNED TRAINING COSTS

- Only three companies were able to provide data regarding their annual budgets for training functions. These figures are summarized below.

Company	Size of Software Maintenance Organisation	Percent Personnel Growth in Last Twelve Months	Current Training Budget ($)
1	50/(systems)	10	500K
2	250	4	600K
3	110	2	80K

- No information was provided regarding project training budgets. However, the following comments were made with respect to general future training trends:

- 'An increasing number of hardware engineers will be trained in software'.

- 'We will be providing more 'people training' education as engineers are increasingly involved in pre-sales consulting roles'.

- 'We will need to train in remote diagnostic techniques'.

VII FUTURE TRENDS IN SOFTWARE MAINTENANCE

A. PERCEPTION OF MAJOR ISSUES

- As presented in Exhibit VII-1, respondents were asked to rate on a scale of 1-5 the importance of a number of major issues which were likely to affect software maintenance policies over the next five years.

1. REMOTE DIAGNOSTICS

- Remote diagnostics is the issue of most concern in shaping future software policies. It has implications for personnel qualifications, maintenance organisation structures, and procedures for accomplishing maintenance.

- Using remote diagnostics to achieve a significant part of the diagnostic segment of software maintenance means that it is possible to support users with less qualified staff in field locations. This implies that it is possible to reduce software personnel costs.

- These cost reductions must be balanced with the increased communications costs for system operation and development and maintenance costs associated with the running of a remote diagnostic centre.

- Few vendors were using remote fault diagnosis techniques. Clearly there is a problem with the size of the installed base. One smaller vendor commented, 'One needs a large-scale operation to justify remote diagnosis'.

EXHIBIT VII-1

RATING OF FUTURE ISSUES ON SOFTWARE MAINTENANCE

	NUMBER OF RESPONSES RATED				
	Least Important				Most Important
	1	2	3	4	5
Remote Diagnostics	2	–	2	2	8
Other Technology	5	–	1	2	6
Personnel Availability	3	2	2	2	5
Distributed Data Processing	4	–	2	4	4
User Involvement	3	–	6	3	2
Firmware	6	1	2	2	3

- However, those vendors operating on a worldwide scale were utilising such methods as a database of standard error correction procedures and a database of user details; e.g., configuration data.

- Exhibit VII-2 shows a conceptual view of a remote support system of the future. As far as INPUT is aware, no vendor has yet developed a system which is as comprehensive as this, although many vendors have implemented parts of it as referred to above.

- The natural language interface/expert system front end is only feasible for products that warrant significant investment. Exhibit VII-3 shows the factors involved and the need to have most of these determinants close to the high end of the scale.

- Although it might not always be cost-effective to have a computer-driven expert system, the natural language interface can assist customers in putting their problems into commonly understood terms.

- This would alleviate one of the problems of electronic mail--ambiguity and misunderstanding. This would make customers far more likely to use the 'electronic mailbox' aspects of an electronic support system.

- Eliminating initial person-to-person contact would help vendor support operations in:

  - Smoothing time-of-day/week peaks.

  - Ranking problems.

- Vendors are already stating that the implementation of remote diagnostic centres will be more cost-effective, enabling the optimal use of specialists.

EXHIBIT VII-2

REMOTE SUPPORT OF THE FUTURE

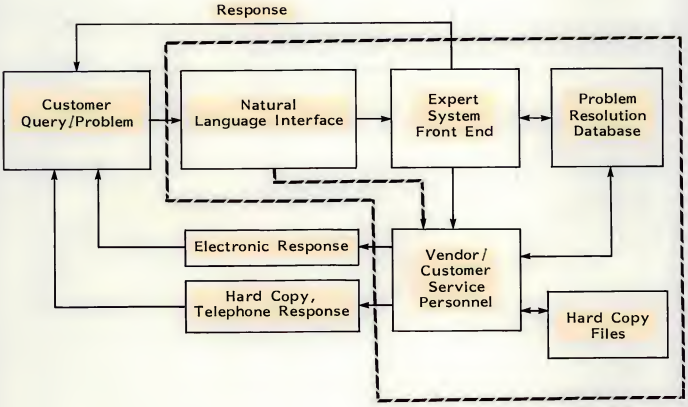
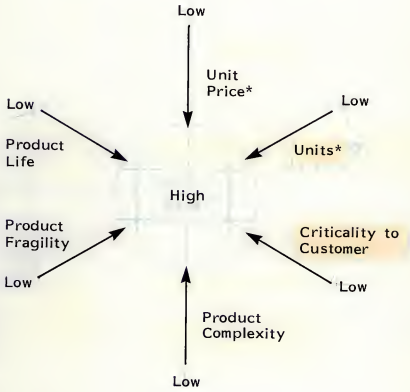


EXHIBIT VII-3

REMOTE SUPPORT SYSTEM: INVESTMENT DETERMINANTS



*Critical

- It is possible with a remote diagnostic capability to involve the user directly in the diagnostic process. The establishment of a communications network to support the centre enables software updates and corrections to be transmitted directly to user sites. Two companies state that they are in the process of implementing this.

2. OTHER TECHNOLOGY CHANGES

- In conjunction with remote diagnostic capabilities, companies recognise that other technology introductions will play an important part in the improvement of cost containment and organisational efficiency, notably:

  - The use of voice response systems for overspill phone calls and voice mail for out-of-hours support.

  - The utilization of video disk technology for software correction and update distribution.

  - User access to corporate databases enabling users to transfer problems electronically and receive programs over the network instead of via tape distribution.

  - The use of artificial intelligence.

  - Increased reliability of software.

3. USER INVOLVEMENT

- Companies believe the more remote you are from the user, the more important it is to train and involve the user in software maintenance as long as methods are devised to ensure that maintenance revenue targets are achieved.

- Companies believe that user involvement coupled with remote diagnostics will lead to a reduction in support costs.

4. PERSONNEL AVAILABILITY

- Personnel availability was the fourth most important issue stated by the companies interviewed. Of primary concern was the ability to retain high-calibre staff to cope with demands placed on their organisation, specifically those resulting from distributed data processing. Remote diagnostics will, in part, offset this demand.

5. DISTRIBUTED DATA PROCESSING

- For those companies not already involved, distributed data processing will increase the number of user sites that need to be maintained over a larger geographic area.

- Similarly, an increase in the user base may include non-DP literate users who may require different levels of support from that currently supplied. As a result, vendors need to reevaluate their current delivery methods of service.

B. EXPECTED CHANGES IN SOFTWARE MAINTENANCE

- Associated with the previous rating of important issues, companies were asked to comment on those areas within software maintenance that may undergo changes in the next five years.

- Whilst all vendors anticipate changes within all aspects of software maintenance, the degree and type of change varied according to the perception of the respondent.

1. DIAGNOSTIC TOOLS

- Ninety-two percent of vendors expect changes to occur in this area. Remote diagnostics is seen as being of major importance in improving efficiency of the software maintenance organisation.

2. ORGANISATION

- Companies foresee the dominant trends to be convergence of support activities in a centralised post-sales support organisation for both hardware and software. The objective is to become single-source suppliers of maintenance to clients and lock out the competition. The goal is to be a 'total solutions' supplier. This move is directly coupled with the increased usage of remote diagnostics.

3. SOFTWARE MAINTENANCE PRICING

- Eighty-four percent of companies interviewed expected changes to be made in software maintenance pricing. Statements made by respondents reflect contradictory opinions.

  - Twenty-one percent of companies anticipated only minimal increases in software pricing because more software problems were handled remotely.

  - Twenty-nine percent of respondents remarked on the introduction of new value-added software support contracts which would enable them to effect price increases that were less visible to the end user.

- As software support organisations become increasingly more important, vendors will have to monitor software service costs and revenues more closely.

4. TRAINING

- Half of the respondents expect changes in training policies. Although it is expected that field sites will be able to operate with less qualified personnel, the current training practices will have to be modified to meet the challenges of this new working environment.

- Companies also commented on their plans to expand training on applications software products because of new low-level product introductions.

5. PERSONNEL

- Thirty-eight percent of respondents anticipated changes in this area. Overall, vendors do not believe the issue to be of primary concern. More hardware engineers are, however, being instructed in software fault diagnosis. The future trend will be towards a polarisation of engineering skills.

C. THE IMPORTANCE OF SOFTWARE MAINTENANCE

- Respondents were asked whether software maintenance activities would increase or decrease in the next five years. Without exception, all managers interviewed believed software maintenance revenues would increase substantially.

- Major reasons given for this increase in importance were:

  - Improvements in hardware reliability, resulting in increased visibility of software maintenance.

  - The differentiating characteristics of software in future sales.

- Expansion of differentiated software contract agreements.

- Increased pre-sales consultancy, environmental planning, networking, and communications consultancy.

- Introduction of more unbundled services.

APPENDIX

QUESTIONNAIRE

A. Software Maintenance Organization

Do you provide support for:-

a) Your own systems software? Yes No

Comments: _____

b) Other system software? Yes No

Comments: _____

c) Your own application software (proprietary)? Yes No

Comments: _____

d) Third-party applications software? Yes No

Comments: _____

1. What is the current size of your customer services organization?

_____

2. Of this total organization, what percent are dedicated to software maintenance? _____%

3. Which of the following best describes the organization of your software maintenance personnel?

Geographic _____

Functional _____

Product _____

Other _____

Please describe

_____

_____.

4. What is the organization relationship between hardware maintenance and software maintenance?

5. During the past twelve months has your software maintenance organization changed in size?

( ) Yes ( ) No

Percent increase _____%

Percent decrease _____%

Please comment: _____

_____

6. Which of the following organization elements are involved in software maintenance?

Field Organization _____

Separate Support Organization _____

Remote Support Centers _____

Other Organization Element (specify) _____ _____

7. If more than one organization element is involved, please describe the relationship among these elements.

_____

_____

_____

_____

_____

B. Software Maintenance Support

1. What types of software maintenance is provided?

_____ Systems Software _____ No. of products

_____ Applications Software _____ No. of products

2. During the past 12 months, how many total maintenance calls did your field service organization handle? _____

3. Of those maintenance calls, how many were software related?

_____

4. Of the software maintenance calls, please indicate the percent handled by the following method:

Phone _____%

Customer Site Call _____%

Comments: _____

_____

5. What types of software diagnostic tools are provided to your field service personnel?

_____

_____

_____

_____

_____

6. What types of software maintenance documents are provided to your field service personnel?

_____

_____

_____

_____

7. What types of software maintenance documents are provided to customer personnel?

_____

_____

_____

_____

8. What is the role of the field service personnel in responding to a "software fault" call at the customer location?

_____

_____

_____

_____

9. What is the cost to your organization of a typical software maintenance call? $ _____.

What is the range of costs for a maintenance call?

$ _____ to $ _____.

10. Is the diagnosis and repair of a "software fault" at a customer site different from a hardware fault in terms of cost?

( ) Same

( ) Increased cost ____%

( ) Decreased cost ____%

11. How are these "software faults" disseminated to other customer sites that have the same system installation?

_____

_____

_____

_____

12. Is the field service organization involved in this process?

( ) Yes ( ) No

If yes, what is their involvement?

_____

_____

_____

_____

13. When your company releases new software, either updates to current products, or new products, what is the role of the following?

a. Field Service Organization:

_____

_____

b. Other Company Service Organization:

_____

_____

c. User:

_____

_____

d. Is the field service organization involved in the installation and test of these products?

( ) Yes ( ) No

If yes, what is the level of invovlement?

_____

_____

C. Software Maintenance Billing

1. Which if the following billing methods do you use for software maintenance?

		Average Monthly Charge
____	Included in monthly/annual service charge.	_____
____	Billed as separate monthly/annual charge.	_____
____	Billed as a Time & Material rate.	_____
____	Other	_____

2. How long has the current billing method been used? _____

3. If less than 18 months, when was it changed? _____

4. What were the reasons for the change? _____

_____

5. Do you provide a software warranty?

Applications S/W ( ) Yes ( ) No
Systems S/W ( ) Yes ( ) No

If yes, for either type software, could you please provide us with a copy.

6. In your company do you consider maintenance as a:

( ) Profit Center
( ) Cost Center

7. If you operate as a profit center, what were your total estimated maintenance revenues in 1984 _____% S/W related _____

1985 _____% S/W related _____

8. Over the next five years at what annual rate do you expect your maintenance revenues to increase _____%.

9. What will be the primary contributors to this increased revenue?

_____

_____

_____

_____

10. Over the next five years, at what annual rate do you expect your software maintenance revenues to increase? _____%.

11. What proportion of these revenues would be for applications software support?

1985 _____%

1990 _____%.

D. Field Service Personnel Selection and Training

1. Please rate the importance of the following sources in obtaining personnel for your field services organization (5 = highest number of personnel, 1 = lowest number of personnel) for 1985 and your projection for 1990.

FACTOR	RATING (1985)	RATING (1990)
a) Hire and train yourself		
b) Recruit from competition		
c) Recruit from other industries		
d) Recruit from other functions within your company (e.g., manufacturing, engineering)		
e) Direct entry from school/college		
f) Other (describe)		

2. Do you have a formal training programme for field service personne in software maintenance?

( ) Yes ( ) No

If yes:

a) On average, how many days does each engineer spend on such training each year? _____

b) How many different courses are offered? _____

c) Are these: i) In-house
ii) External

d) What percentage of engineers have attended formal courses? _____%

e) What will that percentage be by the end of 1986 _____%
1987 _____%
1990 _____%

3. Are all field service personnel required to take these courses?

( ) Yes ( ) No

If no, what are the criteria for selecting personnel to attend these courses? _____

_____

_____

_____

4. What other types of software maintenance training is offered?

_____

_____

_____

_____

5. At completion of software maintenance training are field service personnel given a salary increase?

( ) Yes ( ) No Average Percent Increase _____%

6. As the result of providing software maintenance training have you seen a trend for field service personnel to move to other organizations within the company?

( ) Yes ( ) No

7. What do you estimate will be your total cost in 1986 for software maintenance training? $ _____.

E. Future of Software Maintenace

1. Please rate the following (1 = low, 5 = high) in terms of their importance in shaping your maintenance policies over the next five years.

Factor	Rate	Rank 5's	Comment
Remote Diagnostics	____	_____	_____
Firmware	____	_____	_____
Distributed Data Processing	____	_____	_____
User Involvement	____	_____	_____
Personnel Availability	____	_____	_____
Other Technology Changes (specify)	____	_____	_____
_____	____	_____	_____

2. Do you believe there will be significant changes in any of the following areas over the next five years in terms of software maintenance in your company?

Area	Yes	No	Type of Course
Personnel Qualifications	____	____	_____
Organization	____	____	_____
Training	____	____	_____
Diagnostic Tools	____	____	_____
Price/Software Maintenance	____	____	_____

3. Over the next five years do you believe that within your company software maintenance activities will increase/decrease in importance?

Why? _____

_____